Faculty of
Social Sciences

Negative Effects of Irrelevant Information on Learning Disappear Because People Learn to Ignore the Content, Not Just the Location

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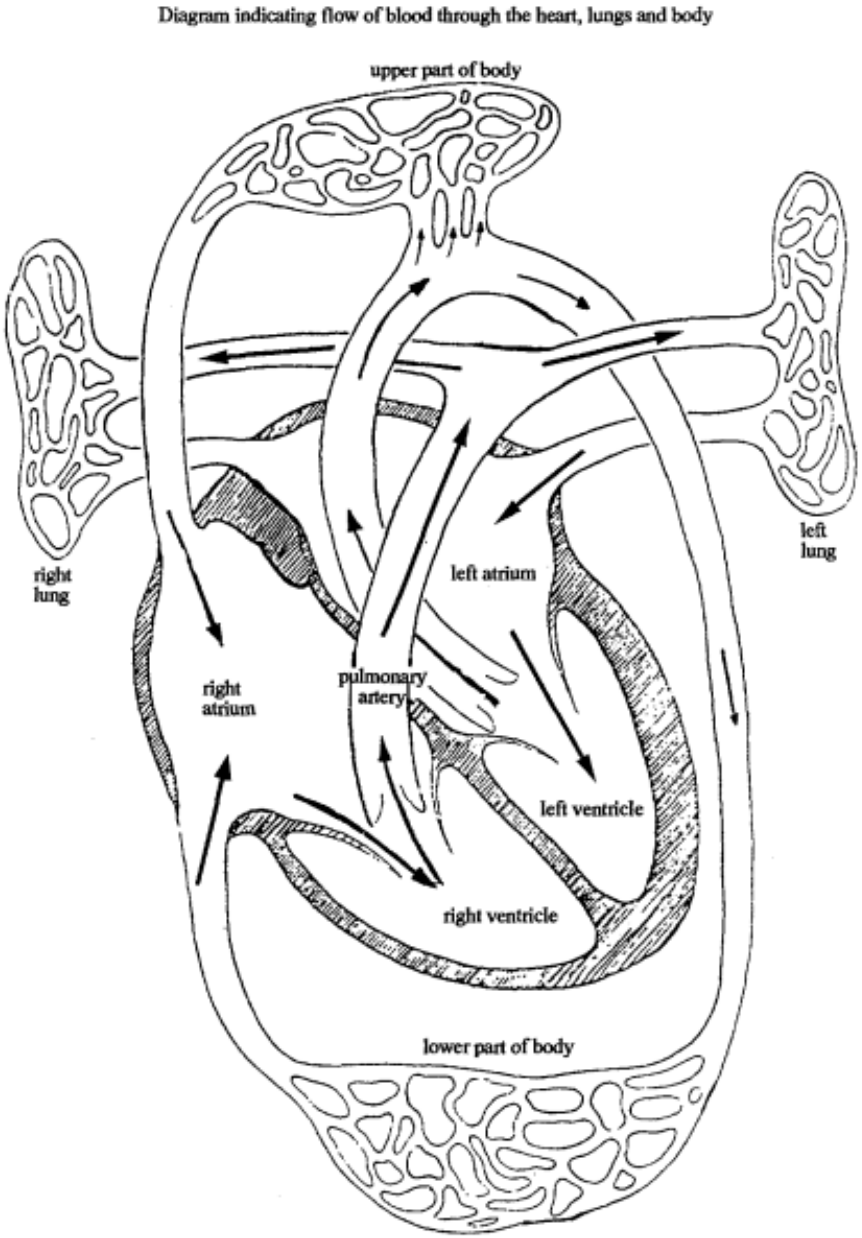
Effects of Irrelevant Information Presentation:

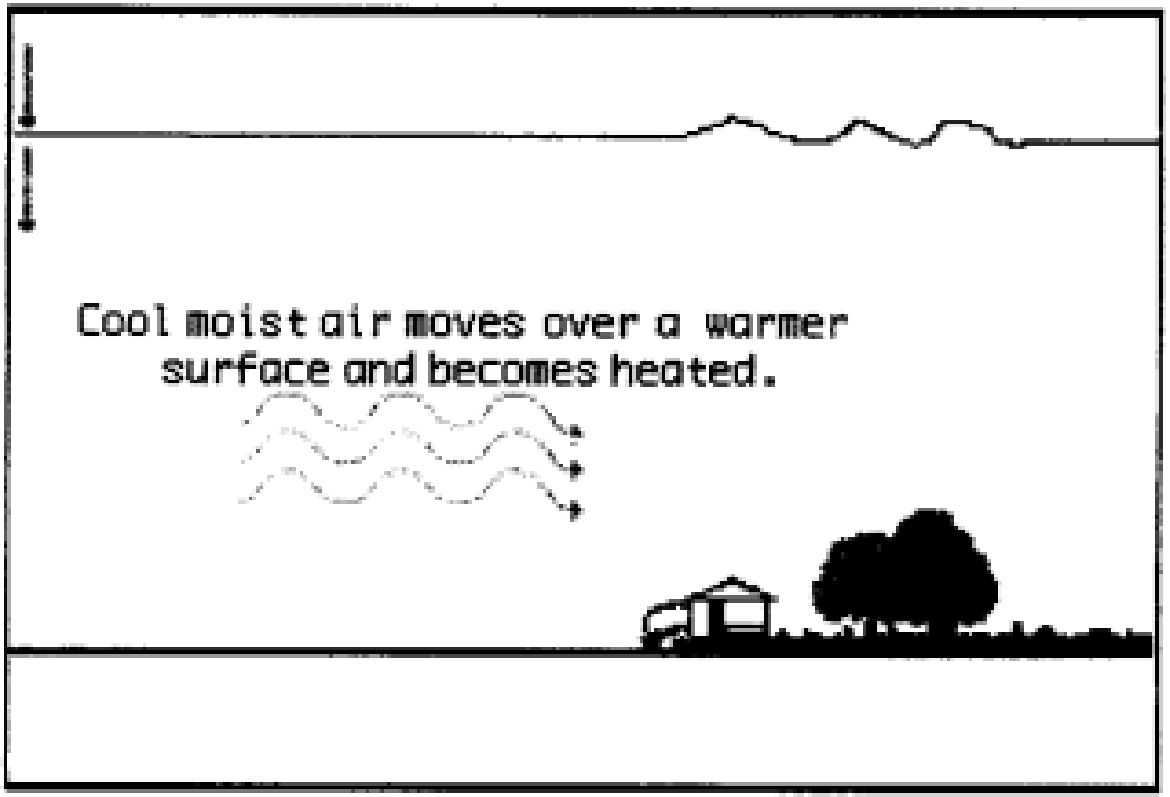
- Cognitive load theory: Redundancy Effect
- Presenting irrelevant or unnecessary information hampers learning (Kalyuga & Sweller, 2014).
- Overload of working memory

Example: Unnecessary Text

- Chandler & Sweller, 1991

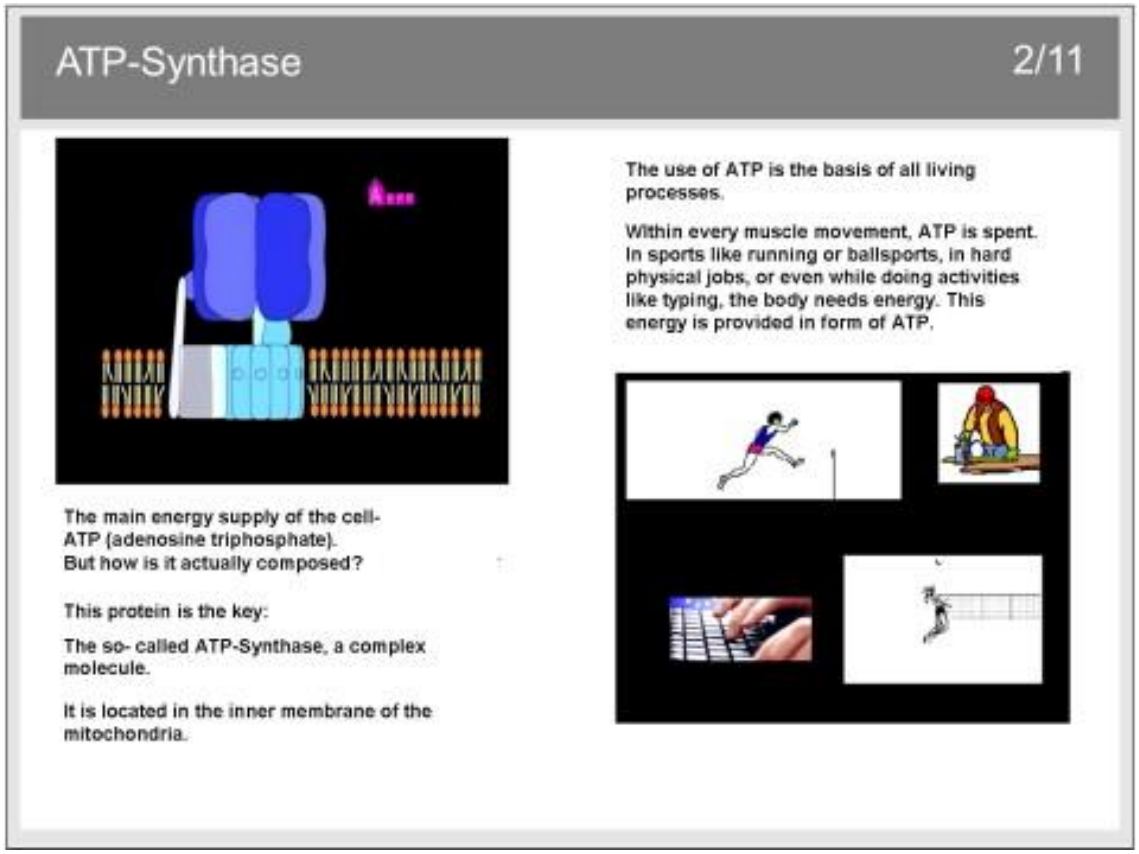


Example: Spoken + Written Text



Moreno & Mayer, 1999

Example: Coherence



Park, Moreno, Seufert, & Brünken (2011)

Eye tracking research on attention to (ir)relevant info

Tenet: Irrelevant information hampers learning because learners cannot ignore it → extraneous processing. However:

- Experts fixate more on task relevant information than novices
  - Chess (Charness, Reingold, Pomplun, & Stampe, 2001)
  - Fish locomotion (Jarodzka, Scheiter, Gerjets, & Van Gog, 2010)
  - Electrical troubleshooting (Van Gog, Paas, & Van Merriënboer, 2005)

- With experience / training, learners start to ignore irrelevant information
  - Implicit learning task (Haider & Frensch, 1999)
  - Weather map inferences task (Canham & Hegarty; 2010; see also Hegarty, Canham, & Fabrikant, 2010)

Would negative effects of irrelevant information on learning disappear with increasing task experience?

Prior study (Rop, Van Wermeskerken, De Nooijer, Verkoeijen, & Van Gog, under review).

Word learning task: Artificial language word coupled with action verb definitions. Word presented in writing, definition via audio. With second presentation of definition:

- No picture,
- Meaningful picture, or
- Irrelevant picture

- Three blocks of 5 words, with cued recall tests after each block.

First presentation / no pictures condition

Meaningful pictures condition

Irrelevant pictures condition

Results prior study

- Irrelevant information *initially* hampered learning, but not after participants gained task experience (Exp 2)

- After the first block, participants adapted their study strategy: They *ignored* the irrelevant information (Exp. 3, with eye tracking)

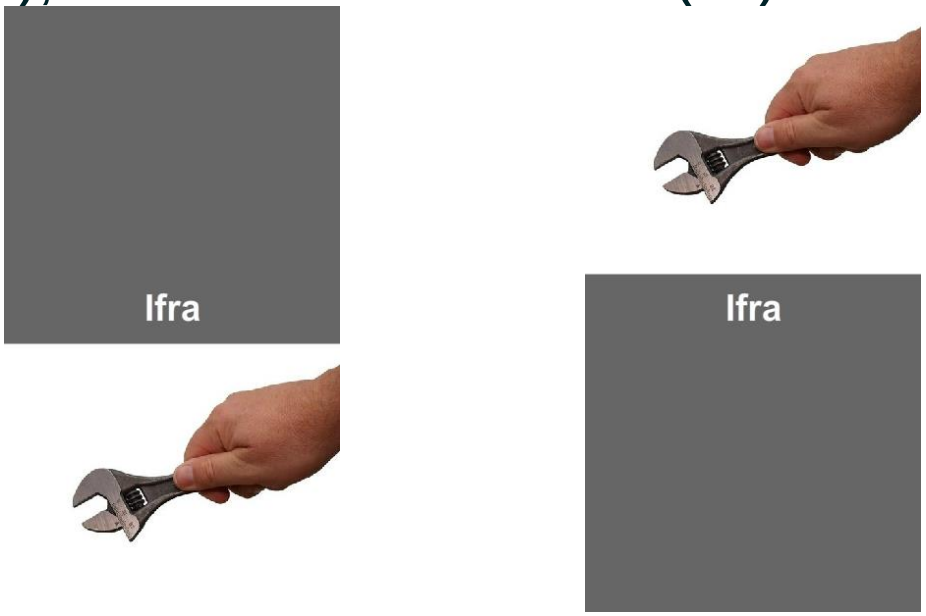
Current Question:

The irrelevant information always appeared at the same location on the screen.

→ Did participants learn to ignore the *content*, or the *location* of the irrelevant information?

Present study

- Participants learned words with either irrelevant or meaningful pictures.
- For half of the participants, the picture location switched in the third block.
- So four conditions: Meaningful (M), meaningful switch (MS), irrelevant (I), and irrelevant switch (IS).



Hypotheses

Attention can be controlled either top down or bottom up.

- H1: If top down influences are stronger, irrelevant pictures will not start to hamper learning again after a location switch.
- H2: If bottom up (saliency) influences are stronger, irrelevant pictures will start to hamper learning again after a location switch.

Method

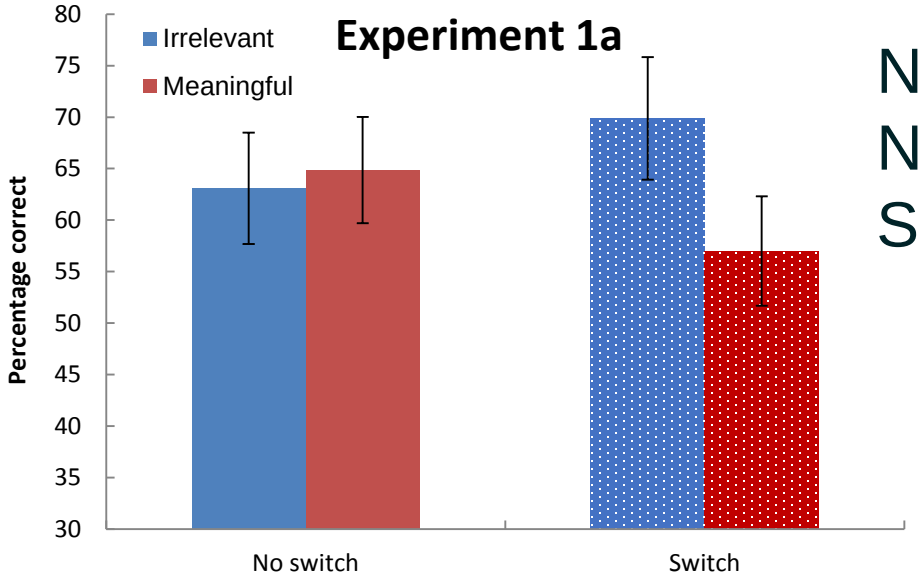
- Two Experiments, to replicate our results

- Participants were recruited using Amazon's Mechanical Turk and were paid $1.50 for their participation.

- Experiment 1a: 327 participants (M_{age} = 37.50),
- Experiment 1b: 352 participants (M_{age} = 36.25)

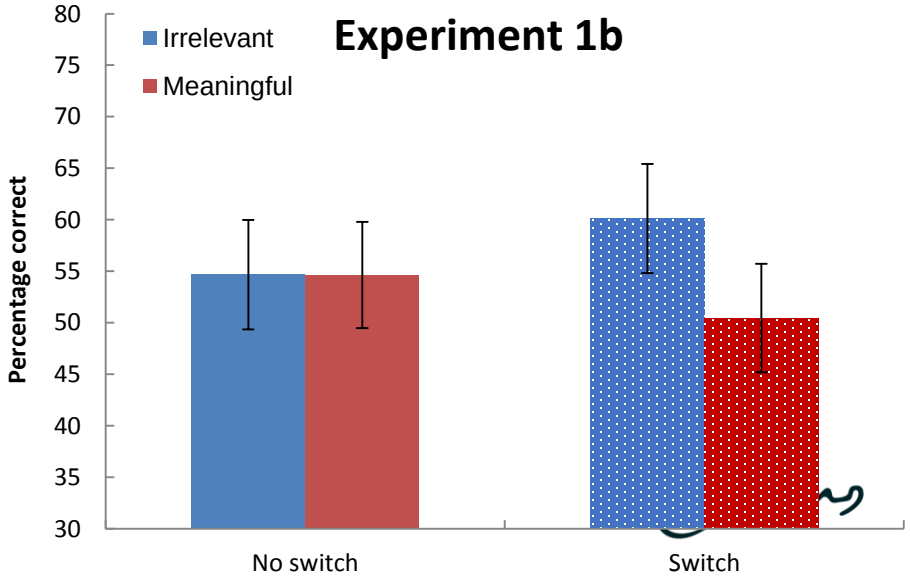
Randomly distributed over the M, MS, I, and IS conditions.

Results Block 3



No main effect of Switch ✗
No main effect of Pictures ✗
Significant interaction ✓

No main effect of Switch ✗
No main effect of Pictures ✗
Trend towards interaction ✓



Error bars represent 95% confidence intervals

Discussion

- Suprisingly, only in the MS condition word learning was hampered in block 3
  - Experiment 1b replicated this result.

- Content determines how pictures are processed: Participants learned to ignore irrelevant pictures, even after a location switch!

- Top down vs. Bottom up.

- Learners can overcome less optimal designed learning materials, even without explicit instruction to do so.

Future directions / Implications

- Study whether these effects also occur with other types of irrelevant information presentation.

- Importance of studying cognitive load effects over time, with repeated task presentation.

- Importance of research on (adaptation of) study strategies and self-managed cognitive load (Agostinho, Tindall-Ford, & Roodenrys, 2013; Gordon, Tindall-Ford, Agostinho, & Paas, 2016; Roodenrys, Agostinho, Roodenrys, & Chandler, 2012).

Thank you for your attention!